

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant(s): Shafer , et al.	
Application No.: 10/789,781	Group Art Unit: 1711
Filed: 2/27/2004	Examiner: T. Boykin
Title: Liquid crystal polycarbonates and methods of preparing same	Confirmation No: 9454
Attorney Docket No.: GEPL.P-093	
Customer No.: 043247	

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Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

RESPONSE TO OFFICIAL ACTION

Dear Sir:

This is in response to the Office Action mailed September 7, 2005 and the supplemental communication mailed October 11, 2005 for the above-captioned application. Reconsideration and further examination are respectfully requested.

Applicants request an extension of time sufficient to make this paper timely. The Commissioner is authorized to charge the fee for the extension to Deposit Account No. 07-0863.

Applicants enclose a Declaration Under Rule 132 relating to the rejection now argued by the Examiner. Consideration of this declaration is requested.

Claims 1-49 stand rejected under 35 USC § 103(a) as obvious over the US Patent No. 4,831,105 or US Patent No. 5,12,975 in view of US Publication 2003/0208027. Without conceding that the secondary reference is actually prior art, Applicants respectfully traverse these rejections.

The Examiner asserts that the primary references teach liquid crystalline polycarbonates that differ from the claimed invention except with respect to recited presence of activated carbonate residues. The Examiner cites the secondary reference as teaching a method of making a polycarbonate using activated diaryl carbonates, and argues that it would have been obvious to

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use such a diaryl carbonate in making the polycarbonates of the primary references. It is argued that this would have been obvious because the secondary reference teaches that the use of activated carbonate "accords improved process conditions."

An obviousness inquiry involves two levels of consideration. First, the reference need to be assessed to determine if they establish a *prima facie* case of obviousness, that is if the references themselves provide the necessary teachings and a motivation to make the modifications or combinations of these teachings that are necessary to arrive at the claimed invention. In evaluating the references, selections should not be made based on the present invention, since obviousness is not properly evaluated from a position of hindsight. Second, if a *prima facie* case of obviousness is found, then any evidence of record that tends to show that the invention is different from or better than what would have been expected must be considered to determine if the invention is actually obvious.

In the present case, the secondary reference lists among the possible dihydroxy compounds the one the materials used to make liquid crystals in US 5,102,975, but not the other. It does not list either material used in US Patent No. 4,831,105. Thus, the secondary reference does not by itself suggest that the method disclosed therein is specifically applicable to these combinations of materials used in making liquid crystalline polycarbonate.

Furthermore, the process carried out in the secondary reference is a melt process. It is known in the art that the melting point of liquid crystalline materials such as those in the primary references is very high, and that oligomers of the liquid crystalline material tend to crystallize as soon as formed. This means that it very difficult to force the reaction to polymers in a conventional DPC-based melt reaction, other than at very high temperatures. At these temperatures, however, the monomers are volatile, and thus, it is difficult to control the stoichiometry of the product.

One of the benefits of using activated diaryl carbonates in the making of polycarbonates such as BPA-polycarbonate is the ability to use milder reaction conditions, for example lower reaction temperatures, and still get a good reaction rate. Nothing in the cited art suggests, however, that this would be of any benefit in the making of the liquid crystalline polycarbonates of the primary references since operating at a lower temperature would not provide a melt of a preformed oligomer/polymer, and would not apparently overcome the crystallization out of oligomers as soon as they are formed.

Applicants believe that the ability to make liquid crystalline polycarbonates from the recited monomers with activated diaryl carbonate reactants arises from different characteristics of the reaction than those that make the use of activated diaryl carbonates beneficial in the case of more conventional amorphous polycarbonates. In an amorphous material such as the

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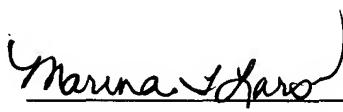
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polycarbonates of the secondary reference, the material softens gradually and reaction can occur in softened portions and the greater reactivity of the activated diaryl carbonate enhances this reaction, allowing the overall reaction to occur at lower temperature. On the other hand, in a crystalline material, such as that which forms when making polymers in accordance with the invention, the transition to melted happens sharply, meaning that higher temperatures are required to drive the reaction, not merely greater reactivity.

Theory would suggest that using a higher activity diaryl carbonate would not allow reduction in reaction temperature for compositions such as those of the primary references relative to the temperature required to melt the crystalline oligomers formed. In fact much lower temperatures can be employed at which the loss of volatile monomers and rearrangement processes are much less significant. Furthermore, it is surprisingly found that the essentially no free monomer remains in the crystallized oligomers at the end of the reaction. This allows the resulting oligomer to be taken above its melting point to proceed with polymerization without loss of monomer, thus retaining the original stoichiometry. In contrast, while monomers may crystallize to some extent in a DPC-reaction, the will contain unreacted monomer such that upon melting monomer will be lost changing the stoichiometry.

For these reasons, Applicants submit that the invention as claimed is not obvious over the cited art. A person skilled in the art would recognize the differences between the high melting crystalline compounds of the primary references and the lower melting amorphous compounds of the secondary reference, and would not assume that the benefits would be obtained in making a high melting polymer. Thus, withdrawal of the rejection and allowance of all claims are requested.

Respectfully submitted,

  
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